

which I am at present acquainted is Lord Walden's (Trans. Zool. Soc. ix. p. 218, 1875), where he notices a male obtained by Dr. A. B. Meyer in this island. This specimen he afterwards, as Marquis of Tweeddale, made the type of a new species, *Macropygia eurycerca* (P. Z. S. 1878, p. 288). Count Salvadori, however, has examined this type specimen, which is now in the National Collection, and considers it to be an adult male of *M. tenuirostris* (Cat. Birds Brit. Mus. xxi. (Columbæ) pp. 346-7, 1893).

GALLUS FERRUGINEUS (Gm.).

An adult male.

Though pretty widely distributed in the Archipelago, this bird has only lately been recorded for Negros by Messrs. Bourns and Worcester (*op. cit.* p. 29).

Mr. Keay tells me that this is a very abundant species in Negros, and that numbers are shot for the table.

STERNA BERGII, Licht.

An adult in winter plumage.

This is another species that has only recently been added to the fauna of Negros, through the labours of Messrs. Bourns and Worcester (*op. cit.* p. 31).

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XXXVIII.—*On the Position of the Feet of Birds during Flight.* By E. W. H. HOLDSWORTH, F.L.S., F.Z.S.

MR. SCLATER's observations (referred to at p. 376 in the last number of 'The Ibis') on the manner in which the Gulls and Egyptian Kites carried their feet, as seen by him during his recent trip to the Nile, are specially interesting to me, as for many years the position of the feet of birds during flight has been a subject to which I have given attention. Individual inquiries into such a subject must necessarily be incomplete; but as, both at home and in Ceylon (1865-1871), I have had many opportunities of making observations, especially on the birds found on the coast and at sea, I will offer a few remarks on the subject in hopes of inducing other

observers to contribute towards making good my many shortcomings.

I have been able to arrive at very definite conclusions as regards two very comprehensive groups of birds—web-footed and wading birds. I feel justified in saying, from personal observation, that the members of both these groups carry their feet stretched out behind. I have met with no exception to the rule.

Among web-footed birds I have observed numerous species of *Larus* and *Sterna*, *Sula*, *Phaëton*, *Pelecanus*, *Phalacrocorax*, *Plotus*, *Fregata*, *Alca*, *Uria*, *Fratercula*, *Podiceps*, and *Colymbus*. I have never been south of the Line, and have therefore little to say about the great family of Petrels, large and small, which are so abundant in southern latitudes. But I have little doubt of their following the rule in the other sea-birds I have mentioned. In our common Stormy Petrel, the tendency of the feet is backwards when these are not actually paddling over the surface, though I cannot say I have distinctly seen them stretched out behind, as is the case with the Gulls and Terns. I need say nothing about the Anatidæ. Everyone knows that Ducks, Geese, and Swans keep their feet turned backwards during flight; and anyone who has seen the anomalous Flamingo on the wing will have no doubt about its following the same rule.

Turning now to the numerous long-legged birds which I have included under the comprehensive title of Waders, I have observed the backward direction of the feet in the following genera:—

Among the Charadriidæ—*Ædicnemus*, *Cursorius*, *Charadrius* and *Ægialitis* (many species), *Vanellus*, *Hematopus*, and *Streptilas*.

Of the Scolopacidæ I have observed *Himantopus*, *Gallinago*, *Tringa* and *Totanus* (many species), *Limosa*, *Numenius*.

Ardeidæ—Several species of Heron and Egret.

Ciconiidæ—*Ciconia*, *Mycteria*, *Leptoptilos*.

I have no personal knowledge of the manner in which the Gruidæ and Otididæ carry their feet, but I have little doubt about their conforming to the rule of the Waders. I have

never had the good fortune to see a Bustard on the wing, and the only Cranes I have seen at large were stalking about the fields in Northern India. Wolf, however, is a trustworthy witness, and in his beautiful drawing of the Manchurian Crane he represents it with the feet behind. *Chionis* and the aberrant *Chauna* will probably be found to agree with the Waders.

The Rallidæ are another doubtful family. It is difficult to get a chance of seeing any one of them when fairly on the wing, as on migration and when flushed the legs are generally hanging down. I expect, however, they belong to the backward-carriers, as their large feet would be much in the way if carried in front.

The large group of Passeres is the one in which I believe the forward direction of the feet during flight will be found most characteristic. The habit is plain enough in the larger species, but it is not easy to observe it in the numerous small ones. I must leave them for further observation. I can add nothing definite about the very curious forms found among the Picariæ, or concerning the Striges or Accipitres. Falconers should be able to tell us something about the latter, and, notwithstanding the unexpected discovery that the Kites carry their feet behind, I do not believe that rule applies to the Falcons or some others of the order.

The Columbidaë, I have reason to believe, carry their feet in front, and I once had a distinct view of the same habit in a Ceylon Jungle-fowl, as it unexpectedly flew over my head whilst I was loading my gun; but I understand that the Pheasant and the Capercaillie both rise with their feet in front, and when well on the wing turn them backwards, so this may be the case with the other Gallinæ, and possibly also with the Pigeons.

The question naturally arises as to what determines the position of the feet of birds during flight. It is not, however, one to which a very definite answer, which will suit all cases, can be given; but I will offer some suggestions which may, perhaps, be thought worthy of consideration. In the case of web-footed birds we have a great diversity of forms,

some of powerful flight, some which spend most of their time in the water, and others, such as the Gulls, which move with almost equal facility on the water, in the air, and on the land. There is also some variety in the proportionate length of the several parts of the leg and of the toes; but they have the one common character of webbed feet. This appears to me to bear on what I regard as the main object of the backward position of the feet—the lessening of resistance to the air.

If a close view be obtained of a Duck or other web-footed bird when swimming, it will be observed that although the toes partially close when they are brought forward, they are only slightly curved, but are bent back from the metatarsal joint, and that at the backward stroke they are straightened and separated by the action of the extensor muscles, aided by the pressure against the water. The toes of a webbed foot do not in fact appear to contract naturally so much as those of a true perching-bird, and the interdigital web, although elastic, would to some extent interfere with both the free closure and the contraction of the toes. Web-footed birds are mostly of rapid flight, the feathers lying very close, and everything being arranged to lessen resistance. If, however, the partially contracted toes were held in front, the webbed foot could not be so disposed of as not to offer some appreciable resistance to the passage of the bird through the air, and there would be some strain on the flexor muscles of the leg and foot to keep them doubled up close to the body. It may be said that Ducks and many other web-footed birds sometimes sleep whilst standing on one leg, the other being doubled up under the flank-feathers; but in those cases the feathers are lying loosely, there is no resistance to the air to be avoided, and some evidence of the position being one of partial strain is shown by the fact that the first thing the bird generally does after putting down its foot is to stretch the whole limb to its fullest extent. The backward position of the leg, with the tibia, tarsus, and toes extended in a straight line, appears to fulfil the desired conditions of muscular equilibrium and minimum of resistance during sustained flight.

Thus far as regards web-footed birds. The same principle seems equally applicable to the Waders, if, instead of considering the webbed foot, we bear in mind the comparatively large foot and long toes which have to be disposed of, and which certainly would not be in any easy or natural position if the leg were doubled up close to the body during flight. Although Herons and some other birds of this group perch on trees, their feet do not appear to be specially suited for that purpose. They look when alighting as if they were not quite in their element among the branches, and the performance seems to have something of an acrobatic character, involving a good deal of balancing, unless the branch on which they first perch be tolerably large and afford a fairly steady resting-place, without much necessity for bending the toes. In the case of the Rallidæ the large toes would be a still greater impediment if held in front; and although, as I have said, I cannot speak from personal observation, I have hardly a doubt about the feet being carried behind. In the Passeres, or true perchers, the legs and feet are usually of very moderate size, and the contraction of the toes appears a natural habit; they clutch the smallest twigs in many cases, and are at once secure and at home on their perch. I should expect, therefore, that there would be no difficulty about doubling up their feet in front, especially as, with a few exceptions, and under the particular circumstances of migration, their flights are only of very short duration. However, I do not want to speculate as to what may or may not be the case.

It will be observed that the length or shortness of the legs has nothing to do with the position in which they are carried. The short-legged Tern and the long-legged Flamingo, the Stilt and the Snipe, have all exactly the same habit in this respect; and this, I think, will dispose of the supposition that the position of the legs has something to do with the balance of the bird. The manner in which the head is carried has probably more bearing on that question.

In very many cases it is extremely difficult to obtain a clear view of the position of a bird's feet during flight, and

my observations are necessarily incomplete; but there must be many field-naturalists to whom the subject is not new, and who would be able to give trustworthy information about many of the birds that I have been obliged to leave for others to deal with.

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XXXIX.—*Bulletin of the British Ornithologists' Club.*

No. XXVIII. (June 29th, 1895.)

THE twenty-seventh meeting of the Club was held at the Restaurant Frascati, 32 Oxford Street, on Wednesday, the 19th of June, 1895.

*Chairman*: P. L. SCLATER, F.R.S.

*Members present*:—E. BIDWELL, F. E. BLAAUW, W. E. DE WINTON, W. GRAHAM, Major A. P. LOYD, E. NEALE, R. NESHAM, W. R. OGILVIE-GRANT, FRANK PENROSE, DIGBY PIGOTT, C.B., Hon. WALTER ROTHSCHILD, HOWARD SAUNDERS (*Treasurer*), R. BOWDLER SHARPE (*Editor*), E. CAVENDISH TAYLOR, Major HORACE TERRY, W. B. TEGETMEIER.

*Visitors*: Dr. DREWITT, HERBERT DRUCE, Heef RENESSE VAN DUIVENBODE, Dr. JORDAN, HENRY STEVENS.

Mr. W. B. TEGETMEIER exhibited a very curious variety of the Common Rook, with white tips to nearly every feather of the body. This specimen was one of several similarly marked young birds procured in the same rookery during the last spring.

Mr. E. BIDWELL exhibited an egg of the Great Auk (*Alca impennis*), from Iceland: from the collection of Baron d'Hamonville, and formerly in the collection of Count Raoul de Beracé.

Mr. W. R. OGILVIE-GRANT exhibited skins of some new species of birds discovered by Mr. John Whitehead in the mountains of Lepanto in Northern Luzon. They were described by Mr. Grant as follows:—